# Status: Tritium Plasma Experiment at the INL Safety and Tritium Applied Research (STAR) Facility

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### **Outline**

- Re-assembly/installation activities
- System integration/testing activities
- Plans for initial plasma operation and experiments

#### **Tritium Plasma Experiment (TPE)**

Steady-state plasma generator

**Tritium and Be compatible** 

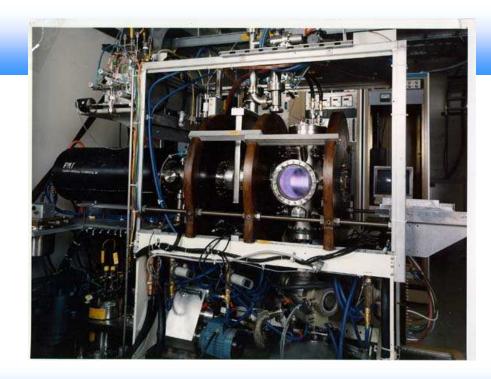
Plasma density: 10<sup>19</sup> /m<sup>3</sup>

Plasma ionization fraction: 1-10%

Ion flux:  $10^{19}$ - $3x10^{22}$  /m<sup>2</sup>

Ion energy: 15-200 eV

Target temperature: 100-800°C





# TPE is located in the STAR Facility

**STAR Floor-plan Layout** Glovebox **Chemical reactivity** Exhaust to MTR Stack Exhaust to MTR Stack **TCS Tritium** experiment Tritium HVAC Supply Air Stack monitor SAS Hood Molten Salt D ion implantation Pit Area HVAC Purification system 26-ft deep B 로 experiment HEPA Blower Glovebox exhaust Hood manifold PC Glovebox Tritium Plasma Exp Flibe preparation 16 ft purification & testing TRA-666A PC PC Rm-102 TRA-666A TRA-666 Rm 103 Table PS Rm-101 HE \_\_ 12 ft-Console BET TRA-666 TRA-666A Flibe-triti High Bay Rm-101 Flibe Salt experimen 2Lif-BeF 25.5 ft 21 ft Temp. Office/ Future Experiments 48 ft Flibe-corrosion TRA-666 15,000 Ci tritium limit Rm-102 experiment Segregation of operations/ventilation Once-through room ventilation Pit Area 10-ft deep Gloveboxes and hoods Cran Electrical MCC **Tritium cleanup system (TCS)** 10 ft Tritium storage and assay system (SAS) 15.3 ft 14.7 ft 40 ft

# TPE Re-assembly, Setup and Operation

- Re-assemble TPE in HEPA-filtered ventilated room
- Install utility services for TPE system in PermaCon room
  - Electrical, water, gas, effluent control, <sup>3</sup>H monitoring
- Interface TPE system to STAR utility services
  - Electrical, coolant systems, glovebox ventilation, TCS
- Check TPE components, update and test
  - Vacuum pumps, pneumatic valves/lines, control instrumentation, water lines, plasma source, power supplies, heaters, gas flow cont.
- TPE system integration and testing
  - Establish system vacuum; operate control instrumentation, power supplies, coolant and gas systems, and plasma source
  - Initiate plasma operation with hydrogen
- Initiate TPE experiments with hydrogen/deuterium plasmas
- Prepare for operation with tritium
  - Glovebox testing, purge gas control, TCS interface, U-bed installation, <sup>3</sup>H source
- Prepare ISMS documentation and procedures

Idaho National Laboratory

Green: completed, blue: partial comp., red: to do

## TPE is in a HEPA-filtered ventilated room



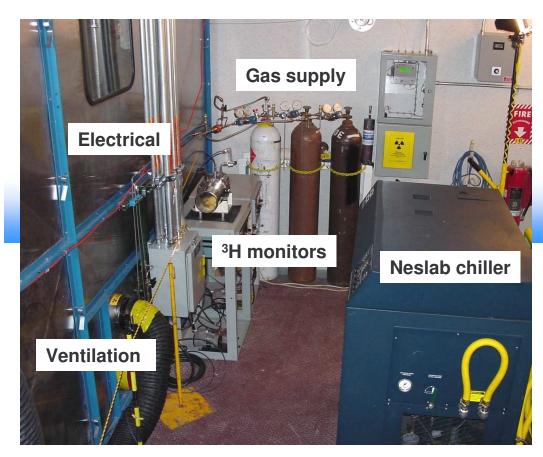
PermaCon enclosure housing TPE and ancillary equipment

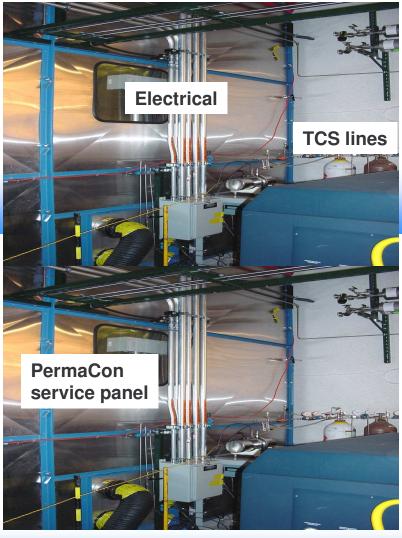


Auxilliary blower and HEPA filter for room ventilation.



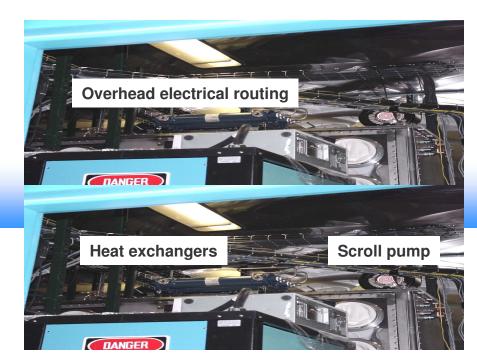
# **Utility services for TPE**

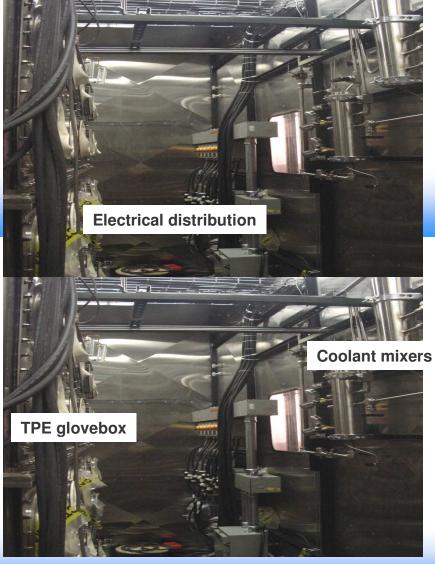






#### Distribution of utility services inside the PermaCon







#### Plans and schedule for TPE set up and operation

- Complete TPE interface to utility services (May-05)
  - Component coolant system
- Complete testing of TPE components (May/June-05)
  - Pneumatic & water lines, coolant systems, control instrumentation, power supplies, plasma source, heaters, gas flow controllers
- Complete system integration & testing (June/July-05)
  - Establish system vacuum, integrated operation of all systems, initiate plasma operation with H
- Initiate TPE experiments: H or D plasmas (July-05)
- Complete preparation for <sup>3</sup>H operation (Sept.-05)
  - Glovebox testing, TCS interface, U-bed install
- Complete ISMS documentation and procedures for initial tests (June/July-05)

